1,012,150

PATENT SPECIFICATION

DRAWINGS ATTACHED

1,012,150

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COMPLETE SPECIFICATION

An Extensible Girder for Supporting Shuttering

We, SECO, STEEL EQUIPMENT COMPANY, P.V.B.A., a Belgian Body Corporate, of 107 Theophiel Van Cauwenberghslei, Schoten-Antwerp, Belgium, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to girders or beams in general, and more particularly to an extensible girder which is especially suited for supporting concrete moulding forms, such as shuttering and the like. Such girders usually comprise an outer member and one or two inner members which are telescoped into and are longitudinally movable with respect to the outer member.

Extensible girders of this general form have previously been used, but the guiding of the inner member within the outer one has been by way of close contact between at least parts of the side walls of the two members. Ensuring such close contact makes manufacture less simple, and furthermore there is a very definite risk of the members jamming if a side wall of one becomes deformed, a common occurrence in the rough conditions under which such girders are used.

The object of the present invention is to provide a girder which avoids the disadvantages, and yet gives positive guiding of the inner member within the outer one.

According to the invention an extensible girder for supporting shuttering comprises an outer member and an inner member telescopically slidable therein, the two members each having side walls depending from a top plate, the members being a loose lateral fit one within the other so that a gap is left between adjacent side walls, and each top plate being formed with one or more interengaging longitudinally extending ribs of complementary shape, the lateral portions of the complementary ribs having a narrow tolerance there-between whereby the two members are maintained in longitudinal alignment with each other.

In this construction according to the invention the gap between adjacent side walls of the two members allows considerable deformation of these to take place without in any way interfering with free relative movement of the two members, and positive guidance of the members is provided by the engaging ribs in their top plates, parts of the members which are rarely deformed in use.

A girder according to the invention will now be described in more detail with reference to the accompanying drawings, in which:—

Figure 1 is a schematic top plan view of the girder;

Figure 2 is a greatly enlarged fragmentary transverse section as seen in the direction of the arrows on the line III–III of Figure 1;

Figure 3 is an enlarged side elevational view of the girder;

Figure 4 is an enlarged fragmentary transverse section as seen in the direction of the arrows on the line V–V of Figure 3 or 5;

Figure 5 is an enlarged fragmentary side elevational view of the upper flange as seen in the direction of the arrow VI in Figure 4;

Figure 6 is an enlarged transverse section seen in the direction of the arrows on the line VII–VII of Figure 4 or 7;

Figure 7 is a fragmentary side elevational view of one end of the upper flange as seen in the direction of the arrow VIII in Figure 6;

Figure 8 is an enlarged transverse section as seen in the direction of the arrows on the line IX–IX of Figure 3; and,

Figure 9 is in enlarged fragmentary section as seen in the direction of the arrows on the line X–X of Figure 8.

Referring now in greater detail to the drawings, and first to Figure 1, there is shown a girder which comprises an outer member 1 and two inner members 2, 2′ which are respectively telescoped into opposite ends of the outer member 1. The top wall portions of the upper booms forming part of the

members 1 and 2, 2′ respectively are formed with corrugations 6 and 9 (Figure 2), the corrugations co-operating as shown in Figure 2 to maintain the members in longitudinal alignment with each other. As shown, the longitudinal central plane of symmetry 3 of the inner member 2′ coincides with the symmetry planes of the members 1 and 2.

Figure 2 illustrates the construction of the upper boom A of the outer member 1 and of the upper boom D of the inner member 2. As shown, the upper boom A comprises a horizontal top plate 5 made of sheet metal and having a central corrugation 6 which forms a downwardly extending rib and a groove. The corrugation 6 is of trapezoidal cross section having two mutually inclined downwardly extending and inwardly converging lateral portions 7a, 7b, and a bottom portion 7c.

The upper boom D of the inner member 2 comprises a top plate 8 which is formed with a corrugation 9 also forming a downwardly extending rib and a groove. The corrugation 9 also comprises two mutually inclined downwardly extending and inwardly converging lateral portions 10a, 10b and a bottom portion 10c which is slightly spaced from the bottom portion 7c so that a gap *b* is left between the bottom portions 7c, 10c to receive any foreign matter which would otherwise accumulate between the upper side of the top plate 8 and the underside of the top plate 5. The tolerances *a* between the lateral wall portions 7a, 10a and 7b, 10b are minimal so that the lateral portions of the two corrugations may actually abut against each other to prevent any lateral movements of the outer member 1 with respect to the inner member 2, or vice versa.

The upper boom A of the outer member 1 is of inverted U-shape and comprises two substantially parallel vertical side walls 14a, 14b, respectively provided with beaded upper end portions 13a, 13b between the side walls and the top plate 5. The upper boom D of the inner member 2 comprises two inwardly bent side walls 11a, 11b. The side walls 11a, 11b need not come into actual engagement with the side walls 14a, 14b because the corrugations 6, 9 provide sufficient guidance for the members to prevent any excessive lateral displacements between the telescoped upper booms A and D. The beaded upper end portions 13a, 13b are preferably formed by a cold rolling process, and their purpose is to increase the width of the top plate 5, which is subjected to greatest stresses when the girder is put to use.

The corrugations 6 and 9 may be rolled into the top plates 5, 8 of the upper booms A, D respectively when the members 1, 2 are manufactured. Such corrugations may be formed with sufficient precision so that the underside of the top plate 5 will be in face-to-face abutment with the upper side of the top plate 8 while the lateral portions 7a, 7b may, but need not, abut against the lateral portions 10a, 10b. The corrugations, as well as aligning the two members, also serve as a means for reinforcing the upper booms, particularly if there are two or more corrugations. However, it is normally sufficient to provide a single centrally located corrugation in the top plate of each upper boom. While the upper booms of the members may be formed with substantially V-shaped corrugations, trapezoidal corrugations as shown are preferred since these allow a wider, shallower form than do V-shaped corrugations, and so improve the rigidity of the members.

The manner in which the upper boom D of the inner member 2 is prevented from falling away from the top plate 5 of the upper boom A of the outer member 1 is illustrated in Figures 3 and 8.

The web of the outer member 1 comprises two diagonal lattices 30, 31 whose crests are welded to the outer sides of the side walls 14a, 14b (see Figures 4 and 8) and whose lowermost portions are welded to two elongated bars 32, 33 forming part of a lower boom C of the outer member. As shown in Figure 8, the lattices 30, 31, consist of metallic bar stock of circular cross section, the diameter of which approximates to the width of the beads 13a, 13b. The lower boom C of the outer member 1 further comprises a pair of spaced transverse cross-members 34, each of which is provided with a central opening for a nut 35 engaging an eye bolt 26 provided with a supporting plate 26a for the lower boom F of the inner member 2. By turning the bolt 26, an operator may move the upper boom D of the inner member 2 toward or away from the top plate 5 of the upper boom A of the outer member 1. The cross-members 34 are welded to the undersides of the bars 32, 33 so that the outer member consisting of the inverted U-shaped upper boom A, the lower boom C (comprising the bars 32, 33 and the cross-members 34), and of the lattice 30, 31 forms a rigid unit. The longitudinal end portions 32*a* of the bars 32, 33, Figures 3, 7 and 9 are bent upwardly and are respectively welded to the outer sides of the side walls 14a, 14b as shown in Figures 7 or 9.

The exact construction of the inner member 2 is described in our copending application No. 1012149/18662/62. The lower boom F of this inner member 2 consists of two angle beams 40, 41 whose upwardly extending portions are spaced from each other to define a gap in which the lower extremities of a lattice web 50, 51 are welded. The crests of this lattice web are received between and are welded to the lower edges 53, 54 of the side walls 11a, 11b of the upper boom D.

The angles 40, 41 of the lower boom F rest on and are slidable along the supporting plates 26a of the eye bolts 26 when the inner member 2 is telescoped into or is withdrawn from the

outer member 1.

When the operator desires to withdraw the inner member 2, he turns the eye bolts 26 in a direction to move the top plate 8 away from the top plate 5, *i.e.*, to lower the inner member with respect to the outer member, whereupon the inner member can be readily moved in the longitudinal direction relative to the outer member.

Referring back to Figure 2, it will be noted that one end of the side wall 11a of the upper boom D of the inner member is provided with an outwardly extending abutment guide 12 which enables the operator properly to introduce the rib of the corrugation 6 into the groove of the corrugation 9 when the two members are assembled in a manner as shown in Figure 3. The guide 12 need not come into actual abutment with the side wall 14a when the inner member 2 is telescoped into the space defined by the upper boom A of the outer member, the lattices 30, 31 and the lower boom C of the outer member 1, *i.e.*, there is a gap *c* between the outer end face of the guide 12 and the inner side of the side wall 14a. Guides similar to the guide 12 may be provided at both ends of both side walls 11a and 11b if required.

The guide or guides 12 of Figure 3 is or are of particular advantage when the girder is in partly extended position so that the inner member rests only on the top plate 26a of the right-hand eye bolt 26. If the operator desires to lower the inner member by operating the right-hand eye bolt 26, the left-hand end portion of the member 2 is likely to descend to such an extent that the corrugations become disengaged so that, in the absence of the guide or guides 12, the inner member would be free to swing laterally with respect to the outer member which would result in excessive misalignment of the members. The tolerance *c* between the end face of the guide 12 and the inner side of the side wall 14*a* may be in the range of 4–5 mm since some lateral play is permissible when the members are not in actual engagement with a ceiling.

To increase the strength of the ends of the upper boom A it is advisable to stiffen the longitudinal end portions of the beads 13a, 13b in a manner as illustrated in Figures 6–7 and/or 8–9. As shown in Figures 6 and 7, the longitudinal end portion of each bead may be provided with a claw member 25 which is welded to the convex outer side of the respective bead and which projects beyond the respective longitudinal end of the upper boom A. The claw member 25 has comparatively small downwardly projecting extensions 24 which are directly welded to the longitudinal end portions of the respective beads 13a, 13b.

Figures 8 and 9 illustrate different stiffening means in the form of rods or studs 23. Each of these stiffening means is welded to the concave inner side of the respective bead 13a, 13b at the longitudinal ends thereof so as to fill up the spaces between the underside of the upper plate 5 and the vertical portions of the side walls 14a, 14b to prevent collapsing of the upper boom A under high stresses such as shearing forces Q acting at the ends of the upper boom A.

An important advantage of the outer member 1 is that the axes 18 (Fig. 5) of adjacent members of each lattice 30, 31 intersect each other in the plane of the neutral axis 19 of the upper boom A. This renders it possible to change the shape of the crests of the respective lattices 30, 31 in such a way that the distance *d* between the crests and the plane of the neutral axis 19 is less in the median portion than at the longitudinal ends of the outer member 1 (see Figure 3). The beads 13a, 13b add to the width of the top plate 5, *i.e.*, the ceiling-engaging upper side of this upper plate is of greater area than in conventional girders in which the side walls and the upper plate enclose an angle of 90 degrees with each other, *i.e.*, which are without beads 13, 13b.

WHAT WE CLAIM IS:—

1. An extensible girder for supporting shuttering, comprising an outer member and an inner member telescopically slidable therein, the two members each having side walls depending from a top plate, the members being a loose lateral fit one within the other so that a gap is left between adjacent side walls, and each top plate being formed with one or more interengaging longitudinally extending ribs of complementary shape, the lateral portions of the complementary ribs having a narrow tolerance therebetween whereby the two members are maintained in longitudinal alignment with each other.

2. An extensible girder according to claim 1 in which each member has a single rib extending along the centre of the top plate.

3. An extensible girder according to claim 2 in which each rib is of trapezoidal cross section.

4. An extensible girder according to any one of the preceding claims in which the ribs are shaped so that, between the lateral portions, the bottom portions of the ribs of the two members are separated by a gap which is large with respect to the narrow tolerance.

5. An extensible girder according to any one of the preceding claims in which the side walls are joined to the top plate by outwardly extending beads at their top edges for increasing the width of the top plate of the outer member, the beads being reinforced at the ends of the outer member.

6. An extensible girder according to claim 5 in which the beads are reinforced by rods or studs welded into the concave inner side of the beads.

7. An extensible girder according to claim 5 in which the beads are reinforced by a claw member having downwardly projecting extensions welded to the convex outer side of the beads.

8. An extensible girder substantially as described and as illustrated in Figures 1 to 5, 8 and 9 of the accompanying drawings or these Figures as modified by Figures 6 and 7.

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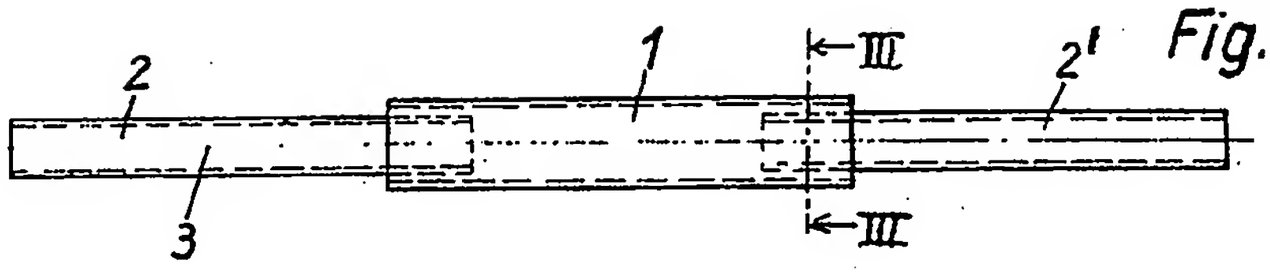

Fig.1

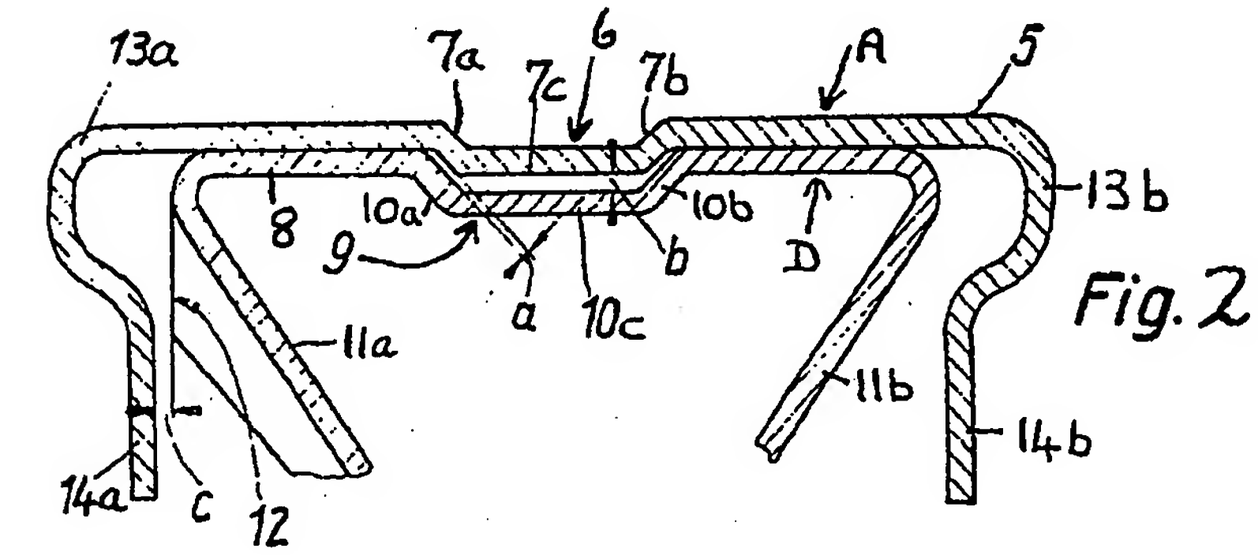

Fig. 2

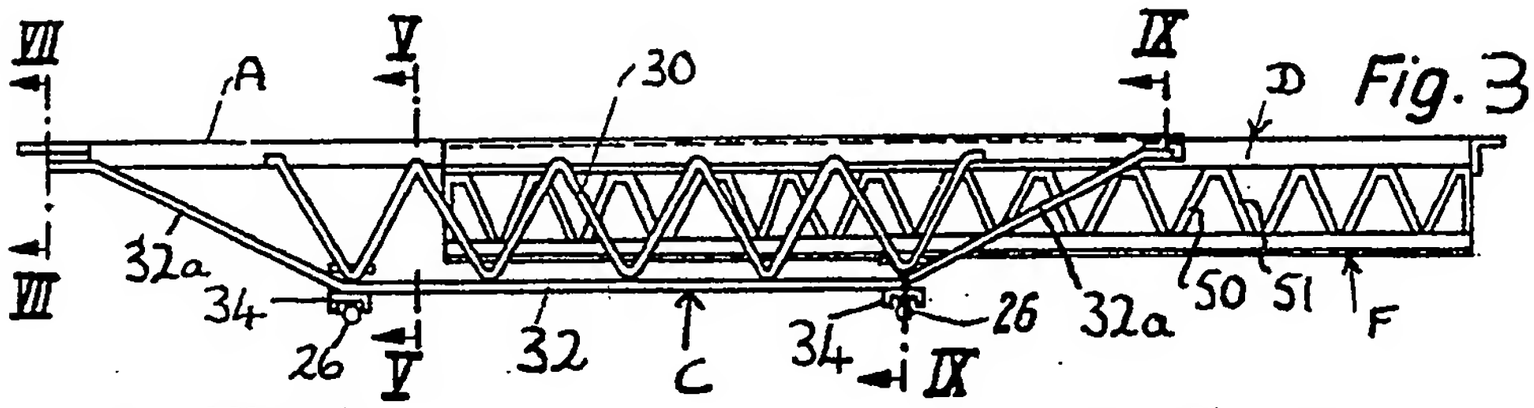

Fig. 3

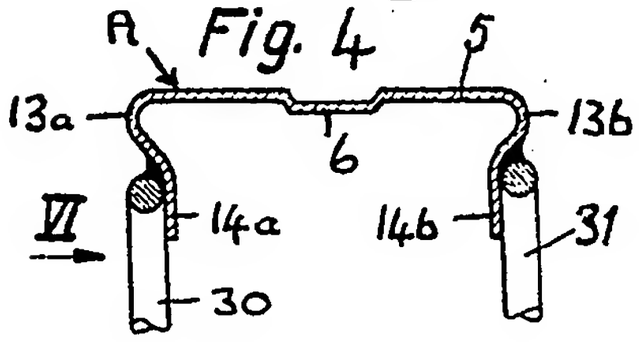

Fig. 4

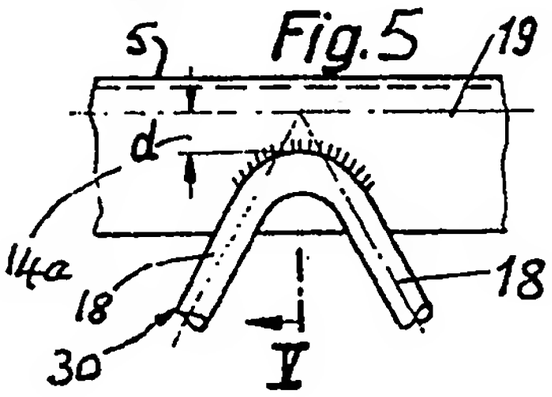

Fig. 5

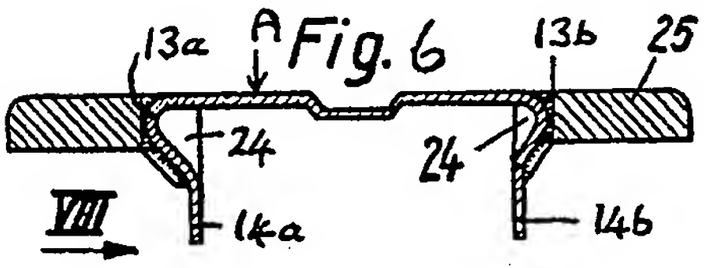

Fig. 6

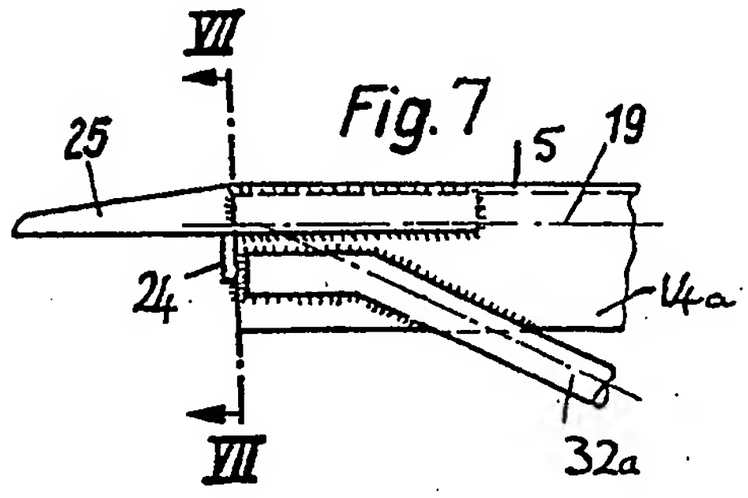

Fig. 7

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2 SHEETS

COMPLETE SPECIFICATION

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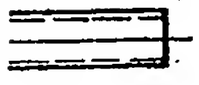
SHEETS 1 & 2

Fig.1



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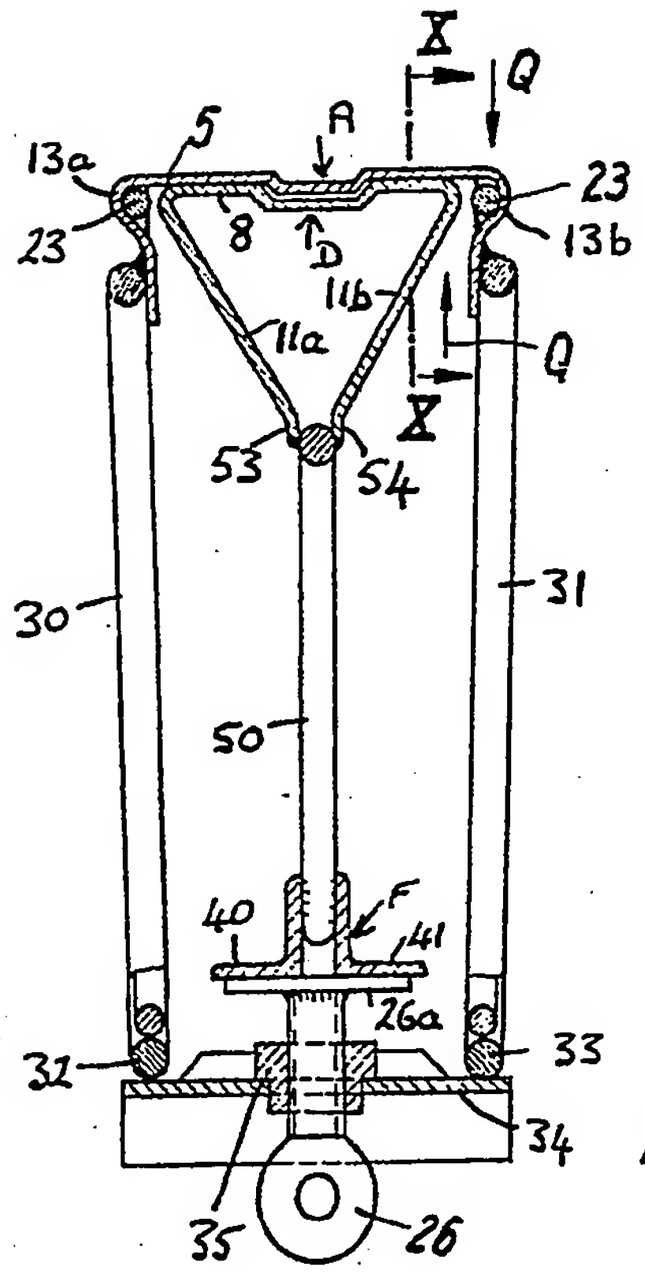


Fig. 8

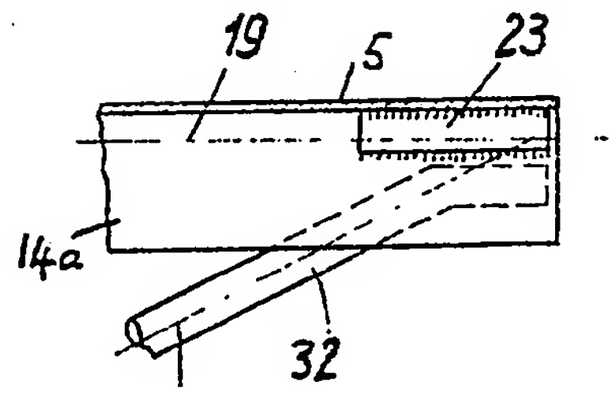


Fig. 9

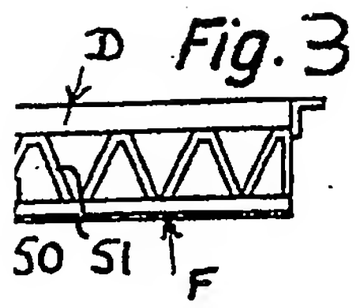
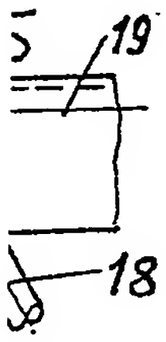
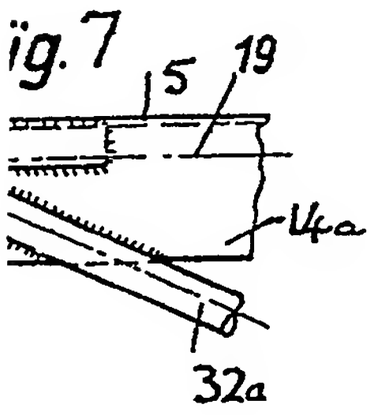


Fig. 3





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2 SHEETS
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SHEETS 1 & 2

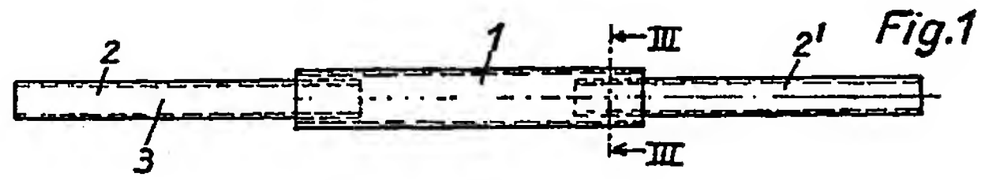

Fig.1

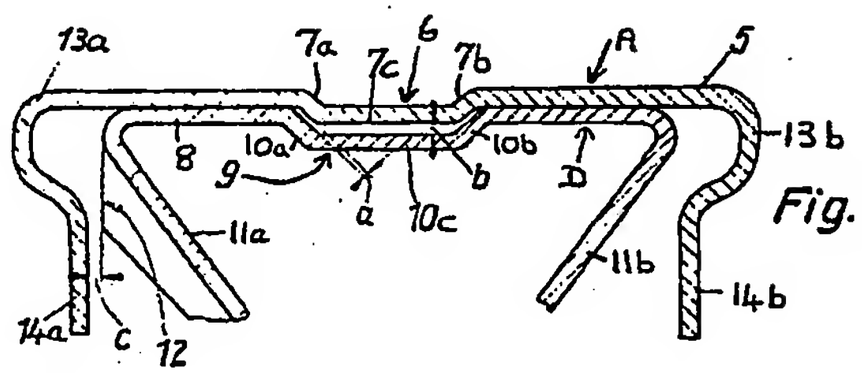

Fig.2

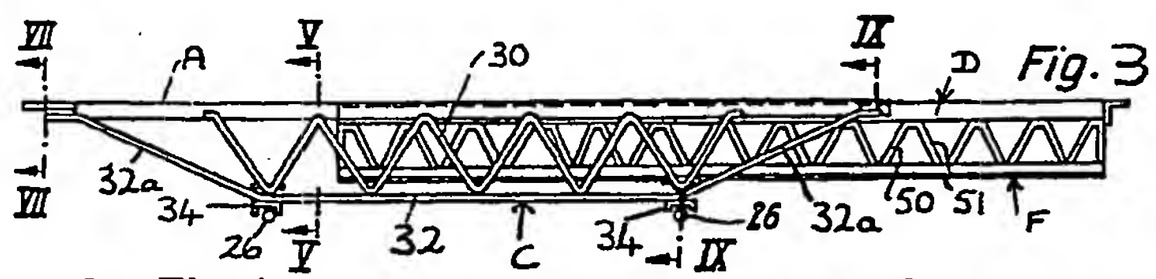

Fig.3

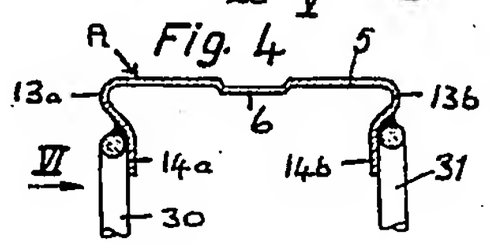

Fig. 4

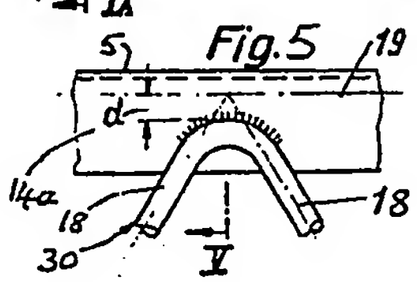

Fig.5

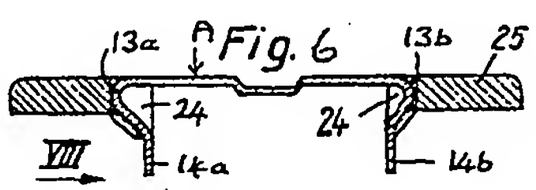

Fig. 6

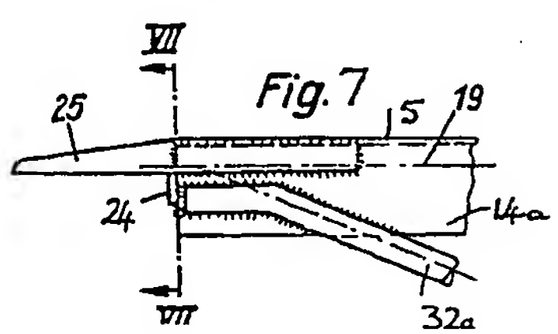

Fig. 7

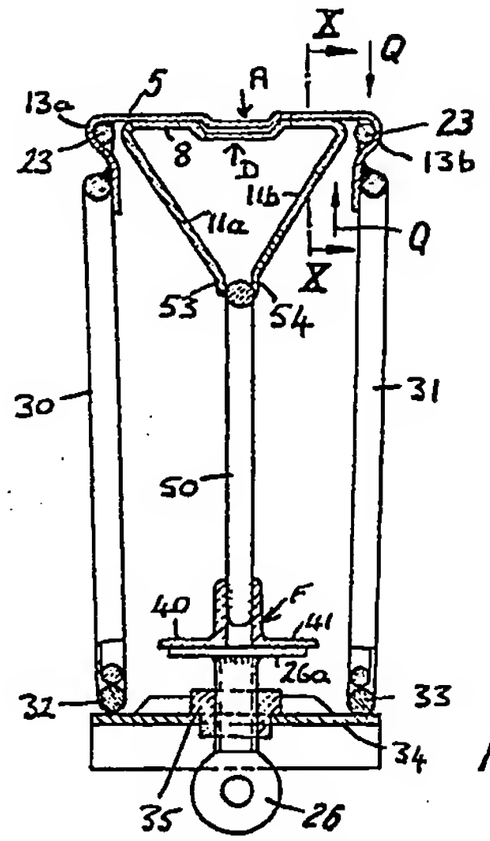

Fig. 8

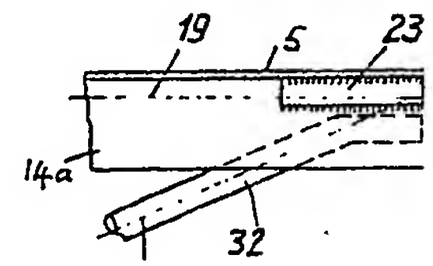

Fig. 9